Public debt and GDP growth in the Malaysian islamic economy

Hassan, Hissam and Masih, Mansur

INCEIF, Malaysia, Business School, Universiti Kuala Lumpur, Kuala Lumpur, Malaysia

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Hissam Hassan[1] and Mansur Masih[2]

Abstract

The Malaysian economy was in the last stretch of its 30-year aim to become a high-income developed nation by the year 2020. Although the original vision has been modified since it was first formulated, it largely remains intact, however, the goal appears challenging to achieve. There are significant structural impediments to achieving sustained and inclusive growth, especially to break through the "middle-income barrier" i.e. to become a high-income. Furthermore, Malaysia is particularly an open economy, sensitive to events in the global economy, including China but also the USA and Eurozone. Public debt levels are a secular concern of government noting that Malaysia promotes Islamic economics and finance (which generally proscribes indebtedness as well as outlawing interest and gambling) and it is considered a major tool in the goal towards achieving growth and stability. This paper explores the relationship between public debt levels and GDP growth in Malaysia using time series techniques to ascertain the significance of public debt to growth in the Malaysian context. The findings are limited by data availability and the techniques employed, but suggest that financial variables such as debt and savings have a relative leading impact on GDP growth. Consequently, policy makers would be advised to continue with structural reforms and not relaxing discipline over financial variables as there is a temptation while seeking an extraordinary growth path.

Key words: Public Debt, GDP, Time Series, Malaysian Islamic economy

[1] INCEIF, Lorong Universiti A, 59100 Kuala Lumpur, Malaysia.

2 **Corresponding author**, Senior Professor, UniKL Business School, 50300, Kuala Lumpur, Malaysia.

Email: mansurmasih@unikl.edu.my

1. INTRODUCTION

Malaysia is a small, middle-income developing post-colonial economy with a small and diverse[1] population of fewer than 30 million people blessed in bio-diversity and rich in non-renewable resources such as oil & gas and other valuable resources (including renewables). Malaysia is a particularly open economy and apart from a small non-resource industrial capability in the electrical and electronic sector, trade in resource-based goods (and re-trade of intermediate and finished goods) is a significant part of the Malaysian economy (and has been for hundreds of years) as it is located alongside one of the world's busiest shipping lanes and between the re-emerging global economic powerhouses of China & India and neighbouring high-growth countries of Indonesia and Singapore.

Malaysia is in the last stretch of its 30-year vision to become a high-income developed nation by the year 2020. Although the original vision has been modified since it was first formulated, it largely remains intact, however, the goal itself appears challenging to achieve. There are significant structural impediments to achieving sustained and inclusive growth, typical of middle-income nations seeking to move from a resource-based and affordable-labour economy to a more value-added high-income developed economy. Malaysia is particularly sensitive to events in the global economy, including the large Asian economies of China and Japan, but also the USA and Eurozone and the globalisation-related interplay between these economies[2]. Public debt levels are a secular concern of the government noting that Malaysia's Debt to GDP level has risen 12 percentage points since the 2008 Global Financial Crisis ("GFC"), close to the government's self-imposed ceiling of 55%. Debt levels are also a concern from the viewpoint of Islamic finance and economics noting that Malaysia is a pioneer and leading promoter of Islamic banking and finance.

Within a macroeconomics framework, there remains much debate between economists on the nature of the relationship between public debt and GDP, thus indicating the complex and heterogeneous nature of the relationship. A central macroeconomic policy question for a government representing the people is typically how much debt is planned to be raised and the impact that debt levels may have on a country's short and long-term growth prospects.

The paper thus explores the relationship between public debt levels and GDP growth in Malaysia using Time Series techniques to ascertain the significance of public debt to growth and other focal variables. The findings are limited by data availability and completeness and the techniques employed, but suggest that financial variables such as debt and savings play a relatively leading role in GDP growth. Consequently, policy would be advised to continue with structural reforms and not relaxing discipline over financial variables as is a temptation when seeking an extraordinary growth path, God willing.

Immediately following this Introduction is a Background section followed by an overview of the Theoretical Framework underpinning the research and a Literature Review. This is followed by a description of the Model and Data and then a presentation of the Estimation Results. The paper ends with a Summary and Conclusion.

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[1] Malaysian citizens are presently split between those ethnic Malay (c. 55%), Chinese (c. 25%) and Indian (c. 10%). The coalition that has led the country uninterrupted since independence is led by a Malay-party though the economy is considered to be dominated by the ethnic Chinese and government-linked enterprises. Relationships between the ethnic groups are generally good though race riots in 1969 instituted various pro-Malay socio-economic policies which are still largely in place.

[2] Singapore is also a major trading partner of Malaysia, but it and China for example are also re-exporting economies and their performance (and hence Malaysia's) is largely affected by final destination economies of the Eurozone and the USA.

2. BACKGROUND

The last few hundred years have witnessed a dramatic increase of the "quantification" of society[3] which has naturally brought discussion of economic matters to greater prominence. An issue of significant concern to stakeholders is the performance of the economy and hence level and trajectory of GDP (represented by aggregate income or aggregate production), given that it is an aggregate indicator for the economic performance of the nation state and its citizens. Given that the government is a significant economic agent in most economies (and especially middle-income developing post-colonial economies such as Malaysia), a major concern associated with GDP is the funding of government investment and expenditure and hence levels of public debt and its relationship with GDP is another leading economic indicator.

These concerns, however, are not recent from the perspective of politics and government. The interdependent relationship between economic growth and political power has undoubtedly been a primary concern of nations for millennia. Similarly, governments have raised debt in different forms including the simple deferment of payment for goods and services recorded on ancient cuneiform documents[4], to raising bilateral loans to present-day sophisticated capital market instruments.

Public debt is primarily used to finance budgetary shortfalls (alongside other fund sources) but it also serves other important functions, including providing investors with a safe investment instrument, and, providing an important liquidity management tool for financial markets (especially banking based on borrow/lending financial intermediation). Sovereign bills and bonds (the primary instruments of public debt issuance) set price/yield at different maturities (i.e. a yield curve) and this is the reference for the pricing of other financial instruments in the non-public sector (e.g. loans, bonds, derivatives in the financial and corporate sectors)[5]. Developed financial markets based on borrowing/lending-based financial intermediation generally require a deep and liquid public debt market. Importantly, developed financial markets have an impact on growth[6] and they enable the banking sector to operate with high leverage levels (which is generally an aim of banks[7] and in the absence of sovereign debt instruments (or their proxies), banks tend to be higher capitalised/less-leveraged (ceteris paribus).

The Malaysian government is an active promoter of quantitative and qualitative growth as outlined in the first bullet-point of the 1991 working paper "Wawasan 2020" or Vision 2020: *"The ultimate*

[3] For example, "The Reign of Quantity and the Signs of the Times" Rene Guenon 1945 and "The Crisis of Islamic Civilization" Ali Allawi 2010 to name a few important works in the English language.

[4] See Graeber (2011) page 38-39 on the use of cuneiform tablets in Mesopotamia in 3,500 BC to record financial transactions and debts.

[5] Financial markets in countries with a fixed exchange-rate have less of a need for domestic bonds as reference pricing may be determined by bonds issued in the reference country (after adjustment), noting that Malaysia has a managed exchange-rate that attempts to smooth short term volatility yet capture long term movements of the domestic currency against reference currencies (including the US Dollar).

[6] The causal relationship between economic growth and financial market growth is complex and the relationship is generally positive from a quantitative perspective, though even then, there a "crowding-out" effect whereby excessive financialisation of an economy may draw resources away from more productive sectors. See Haldane (2012) amongst others.

We also note that the Bank Negara Financial Sector Blueprint 2011 -2020 plans for an increase in the size of the Malaysian financial system to six times GDP by 2020 (from 4.3 times in 2010).

[7] See Haldane (2009) – returns on banking from leverage not from efficiency.

objective that we should aim for is a Malaysia that is a fully developed country by the year 2020.". This Vision has since been elaborated and modified but is still largely pursued by the present government.

The Malaysian government is also a promoter[8] of Islamic finance and economics and, in the context of economic growth and development, the faith-based[9] perspective is both deep and nuanced, as can be expected, see for example, the following narrative from the life of the Prophet of Islam (peace be upon him):

> Narrated by Abu Hurayrah in Sunan Al Tirmidhi, the Messenger of Allah said that Allah said "Son of Adam, if you devote your heart to the un-preoccupied worship of Me I shall fill your breast with sufficiency and make your poverty cease; but if you do not do so I shall fill your hand with work and not make your poverty cease."

In other words, the Islamic perspective is that sufficiency is critical and production (and efficiency) may not alleviate poverty in of itself. Much work has been undertaken to elaborate the Islamic view of growth and development and here we would like to quote one leading Islamic economist's view as an example:

> "...unless Development Economics sheds its secularist approach and takes into account moral as well as material uplift, self-interest as well as sacrifice, individuals and firms as well as families (not just households), other social networks and the government, it may not be able to promote the real goal of development which is the well-being of all mankind."[10]

With respect to debt, it is generally anathema in Islamic economics, except debt that is interest-free or established incidentally to a sale (and is interest-free). Public debt is arguably legitimate under certain circumstances and was observed to be present in traditional Islamic governments, for example, through the deferred payment for goods and services or tax farming (the Malikane or Es'ham instruments observed to be used by the Ottomans, see Cizakca (2012)). Present-day Islamic finance has developed public debt instruments called sovereign sukuk, though not without controversy (see Usmani (2008)), mainly due to their strong resemblance to sovereign bonds (in financial terms and conditions and risk/reward payoff structure) and weak linkage to underlying contracts (asset-based vs. asset-backed, Dusuki and Mokhtar (2010)).

Given the importance of sovereign public debt instruments in banking and financial markets noted above, the continued growth in Islamic banking in Malaysia based on the conventional architecture of fractional reserve lending/borrowing requires a bond-equivalent, hence the importance of bond-like sukuk in Islamic banking (if Islamic banking is to continue to develop to replace and replicate non-Islamic banking)[11].

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[8] Following independence in 1957, Malaysia was an early pioneer in Islamic investing in the 1960s through them establishment of Tabung Haji savings investment fund. The government was a prominent founding member of the Islamic Development Bank in the early 1970s and hosts many international Islamic finance bodies (including the IFSB, ILMC and the secretariat of the WIEF). It established a dual-banking system through sponsoring the establishment of the country's first Islamic bank in 1983.

[9] We say "faith-based" in this context, for, when describing his chapter 4 on Buddhist Economics, E.F. Schumacher writes: "The choice of Buddhism…is purely incidental; the teachings of Christianity, Islam, or Judaisim could have been used just as well as any other of the great Eastern traditions." Small is Beautiful

[10] Chapra, M. U., (2003). "Development Economics: Lessons that Remain to be Learned". Islamic Studies, Vol. 42, No. 4 (Winter 2003), pp. 639-650

[11] Another stated goal is to increase the share of Islamic finance in the domestic financing market from 29% in 2010 to 40% by 2020 [The Bank Negara Financial Sector Blueprint 2011 -2020 [pages 45-47].

However, a more authentic Islamic equivalent of public debt would arguably be a risk-sharing equity instrument (Mirakhor (2010)), where returns and pay-off are determined ex post, contingent upon actual performance, rather than the ex-ante fixed returns and claims of bonds. These would ideally be investment-linked instruments where returns are derived from the underlying investment but they may also be consumption-linked, perhaps in a form based upon the tax-farming instrument used by the Ottomans (e.g. legal ownership of future revenue flows, a form of discounting or securitisation).

Similarly, a more authentic Islamic form of financial intermediation might be an interest-free full-reserve narrow-banking model, where surplus savings are deployed on an investment rather than financing basis and the deployment of a framework similar to this (though not interest-free) has been modelled recently and provides for significantly reduced public debt levels[12].

The alternative capital funding structure through risk-sharing equity-based instruments that Islamic finance advocates would make the issue of the relationship of public debt to GDP much less relevant (given the inherent shock-absorbency qualities of equity in contrast to the one-sided features of debt[13]).

This background discussion on GDP and public debt is important to fully appreciate the Malaysian perspective on growth and debt for the future, the central theme of this research. We now proceed to describe the theoretical framework underpinning the research we have undertaken.

3. THEORETICAL FRAMEWORK

Given the importance of GDP and Public Debt, a vast amount of theory has been accumulated on the relationship between the subject parameters. The relationship is complex primarily due to a number of factors including: (i) the large number of potential determinants of GDP [and these determinants depend upon the nature of the particular economy] and the inter-relationship between these determinants; and, (ii) the potentially wide and deep relationship that public debt has on various GDP determinants (and sub-determinants) given the impact that capital and capital structure has on, for example, levels of production, consumption, investment and savings and the role of sovereign debt in setting benchmark pricing in the financial markets (briefly discussed above).

Theoretical work on public debt lies at the heart, or at least close to the heart, of some critical pieces of modern macroeconomic economic theory.

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[12] Benes, J., Kumhof, M. 2012. The Chicago Plan Revisited. IMF Working Paper No. 12/202.
The paper uses a "..state-of the-art monetary DSGE model…"[page 6] to model the transition to a full-reserve narrow-banking framework and their results found various benefits including "…output gains are very large, approaching ten per cent..." [page 52] and a reduction of net government debt as (i) "…Money is therefore properly treated as government equity rather than government debt..." [page 6] and (ii) banks need to borrow to lend (as opposed to creating loan assets against minimal reserve requirements), reducing net liabilities.
Other benefits include enhanced monetary policy efficacy (through the decoupling of the quantity of money from the quantity of credit); the elimination of bank runs as banks are fully-funded by equity and investment deposits or loans resulting in lower credit monitoring costs (less regulation required, no deposit insurance and tax payer guarantee (as deposit insurance tends to be too small given the super-high-leverage in banking)), a fall in real interest rates and seigniorage revenue increases (allowing taxes to fall).

[13] Debt is one-sided as primary and secondary pricing of both debt and equity-based instruments respond to expectations of future returns, whereas, payoff claims under debt remain fixed regardless of actual performance, in contrast to equity claims which change according to actual returns.

One of the theories of the 19th century classical economist Ricardo was termed the Ricardian equivalence and it was 'resurrected' in 1974 by the eminent new classical economist Robert Barro. The theory broadly states that, under certain assumptions[14], taxation and public debt are equivalent to each other given that they represent timing difference (tax now versus tax later to repay debt) that rational tax payers would factor in to their behaviour.

Associated with this theory are the contrasting theories of the Wealth Effect[15], Fisher's Paradox of Debt[16], the Paradox of Thrift[17] popularised by the influential 20th century economist Keynes and Hayek's Paradox of Savings[18] and more recently, Krugman's Paradox of Debt[19]. For example, Keynes' advocated the selective use of public debt to be used in public investment and development expenditure and to revive the private sector such that this would have a multiplier effect in periods of downturn when the private sector is retrenching, and thus it would enable the economic cycles to be smoothed or less pronounced. Keynes did not advocate the unbridled use of debt though critics point to this potentiality arising from his influential work.

Theories also take in to account the nature of money and the simplistic argument that governments can simply print more money to pay-off local currency debts disregards the adverse signalling impact and consequences this would have on levels of inflation, interest rates and savings and investments.

Other theories point to the issues of efficiency (public sector vs. private sector, quality of institutions), inequality alleviated by or arising from increasing public debt (wealth transfer theories), the environmental and ecological consequences of public debt (short-termism of debt-based spending vs. long-term spending derived from more sustainable capital sources), the crowding-out or crowding-in effect (e.g. in terms of private sector activity and funding availability).

With respect to GDP growth, the neoclassical growth model developed by the economists Solow and Swan in the 1950s postulate that growth is a function of technology, labour and physical capital.

The following Literature Review will expand more on empirical research undertaken on the vast amount of theory on the relationship between the two variables.

[14] Most economic theories are based upon a set of simplifying assumptions that are not considered to be realistic.

[15] Barro's influential 1974 "Are Government Bonds Net Wealth?" [Barro, R. J., (1974). "Are Government Bonds Net Wealth?" Journal of Political Economy 82(6): 1095-1117.], pointed to the intergenerational effects of public debt and how the net wealth effect could be positive or negative under differing circumstances.

[16] The paradox of increasing debt payments and increasing debt liabilities, i.e. debt deflation effects identified by the economist Irving Fisher post the 1929 Crash.

[17] That savings and retrenchment during a downturn exacerbates the effects of the downturn, delaying recovery.

[18] Friedrich Hayek, in response to the Paradox of Thrift of Keynes, postulated that there is a Paradox of Savings whereby prices would adjust due to the reduced direct investment in production and this would affect production more than the effect of a change in capital structure brought about by the increased level of savings.

[19] Similar to Fisher, where debt initially boosts returns but debt overhangs and debt deleveraging can result in lower growth levels due to perceived increased probability of default, less available capital in times of stress, and, higher debt servicing costs. See, Eggertsson, G.B. and Krugman, P. (2012) Debt, Deleveraging, and the Liquidity Trap: A Fisher-Minsky-Koo Approach. The Quarterly Journal of Economics (2012) 127 (3): 1469-1513

4. LITERATURE REVIEW

As can be expected given the complex theoretical nature of the relationship between GDP and public debt, most empirical research is inconclusive and points to either a positive or negative relationship between the two variables.

To summarize, much of the recent empirical research suggests that there in a non-linear relationship between public debt and GDP, such that, based on prevailing conditions, there may be no effect on GDP growth up to certain levels of public debt to GDP (or a slight positive effect) and that this benign effect plateau's as debt/GDP exceeds certain boundaries and a negative effect occurs thereafter, i.e. increasing public debt/GDP over a certain point comes to negatively affect GDP growth (see Reinhart & Rogoff (2010)) and Kumar & Woo (2010). However, an observed relationship or correlation between the variables does not necessarily imply a causal relationship. The link between public debt and GDP could be due to low growth leading to lower than expected earnings and hence higher proportionate levels of debt. Alternatively, the observed correlation between debt and growth could be due to other factors that have an impact on the two variables.

In a series of academic articles and a New York Times best-selling book, Reinhart and Rogoff, building on the work of Krugman (1988), undertook ground-breaking studies in to sovereign debt crises over a period of up to 800 years and 66 countries (the academic articles typically cover a shorter period of up to 200 years and 40-plus countries). Very broadly, in Reinhart and Rogoff (2011) their findings support theoretical intuition that the chain of events that lead to a sovereign debt crisis starts with surges in private debt levels, followed by banking crises (domestic and international) and public debt surges rises (foreign debt and "hidden" domestic debts). In Reinhart and Rogoff (2010) their study finds differing debt thresholds and impact on whether the country is an advanced or emerging nation; respectively debt levels generally below a threshold of 90% (advanced) and 60% (emerging) are statistically weak and above these thresholds growth is observed to have declined considerably - 1% and 2% for advanced/emerging nations, on a median basis, and even more on a mean basis. The authors have been explicit that their results did not prove the existence of a causal relationship between debt and GDP, however, in this current period following the 2008 GFC, their work has been held used to support fiscal consolidation.

In an IMF Working Paper, Kumar and Woo (2010) find that persistent high levels of public debt can trigger detrimental effects on capital accumulation and productivity, which may potentially have a negative impact on economic growth. Cecchetti et al (2010) find that the persistent growth of government expenditure impact debt levels as government revenue declines and that this may continue to be a drag on growth and keep debt persistent in non-recessionary periods.

Regarding the stock-flow relationship between debt and government deficits (debt is at a point of time and a deficit is over a period of time), Campos et al (2006)[20] use data for over 100 countries over a period of 30 years (1972–2003) and show that in the average country-year, debt grows 3 percentage points of GDP faster than the growth derived from the budget deficit (this value is obtained after dropping outliers. The highest observed variances are in the emerging markets of sub-Saharan Africa, Latin America and the Middle East and this could be due to a number of reasons including integrity in government data.

For Malaysia, the recent IMF Article IV country report has a section on debt/GDP levels and finds, in consultation with the government that under the baseline scenario, debt/GDP is expected to decline to 51% by 2017. The IMF bound tests indicate the debt/GDP is highly vulnerable to GDP growth and interest rate shocks as intuitively expected. They also note that Malaysia's public debt has a very

[20] Campos, Camila, Dany Jaimovich, and Ugo Panizza (2006), "The unexplained part of public debt", Emerging Markets Review, 7(3):228-243.

small external debt component of 16% and that this is projected to fall to 10% in 2016 under the baseline scenario.

Other side-points to briefly note in the context of the relationship between public debt and growth in the Malaysian context (especially given the country's aspirations to become a high-income nation), are related to the complex nature of growth and qualities of a high-income developed nation. These are mentioned briefly in point form:

- Government spending efficacy (public debt funds government spending)
  A recent IMF Working Paper[21] observes that the multiplier effect of government spending in Malaysia has fallen dramatically to 80% from 128% in the Pre-Asian crisis period.
  10% of op expenses are debt service
- Budget discipline
  Fourteen consecutive years of fiscal deficits in Malaysia, from the 1998 Asian Financial Crisis, averaging 4.8% in the last 5 years. For 2011:
  - Government income approximately 36% from oil-related activities and subsidies form 20% of expenses.
  - Contingent liabilities high at 72% of GDP
  - High savings rate of 36% of GNI
  - Investment spending low 24-25% of GDP, compared to pre Asian Crisis levels (when the 2020 Vision was set) of 45% of GDP.
  - Public Debt as a percentage of GDP witnessed a large jump during the 2008 Global Financial Crisis, inching towards the 60% indicated by Reinhart et al (2012) for developing countries.

- Crowding out vs. crowding in effect of the public sector
  Public debt potentially crowds out private debt (Emran et al 2007) and hence private investment . Public debt provides safe assets, therefore allows for banks to take more risky assets (Kumhof and Tanner 2005).

  Missing middle – private companies contribution to GDP in advanced vs developing countries Beck (2005)

- Institutional effect Cavallo 2011 – weak institutions could diminish +ve effects of public investment projects.

  Morissey et al 2012 good governance attracts FDI which has a crowding out effect on private investment

5. MODEL AND DATA

As noted briefly above, there are numerous determinants of long-run economic growth and the main or core factors include the levels of: capital stock, labour (quantity and quality), technological

[21] IMF WP/13/149 The Growth and Stabilization Properties of Fiscal Policy in Malaysia Sohrab Rafiq

progress, institutional quality (rule of law, stability, organisational quality etc.), savings and investment, and, demand for goods and services.

In conducting this research we found that data for Malaysia, especially in years prior to 1990, is incomplete and inconsistent. As a consequence, we have limited our research to the following data variables that were available for the period of review which covers 31 years starting 1980.

- DBT: Public Debt / GDP
  A measure of Public Debt levels (local onshore and external offshore) as a percentage of GDP.
  Source: Reinhart and Rogoff (2010)[22]

- LLBR: Employment Levels (log form)
  The number of employed persons, as a proxy for labour.
  Source: International Labour Organisation (for 1980 – 2008) and the Malaysian Department of Statistics (for 2009-10). Data is nearly identical for both sources but missing for 1991 and 1994 and, as an approximation and given the generally upward sloping trend in the data, we calculated midpoints as approximations for those two years.

- LGDP: Gross Domestic Product (log form)
  Total Gross Domestic Product in United States Dollars in log form.
  Source: WDI World Development Indicators

- LSVG: Savings (log form)
  Total Savings in local currency units in log form
  Source: Datastream

We attempted to include additional variables in the data set but we encountered problems with certain variables in Step 1 testing for Stationarity. These variables are: Investments (GFCF), Imports and Exports and were not found stationary in their differenced form.

As proxies for technology or quality, we found incomplete or insufficient data for indicators such as public spending on education and enrolment in tertiary education, where data was missing for several years in both cases.

Data availability for Malaysia is an issue. Quality of data may be an additional issue but not we will not discuss quality issues in this paper.

[22] Sources listed by Reignhart and Rogoff include the World Bank, IMF, Ministry of Finance of the Government of Malaysia, Bank Negara Malaysia (the Central Bank of Malaysia)

6. ESTIMATION RESULTS

The following estimation results were generated.

6.1. Step 1 Testing Stationarity

First we test the data for stationarity, that is whether the mean, variance and covariance are constant over time. This unit root test is essential to ensure that the trend or theoretical component is retained by the variables, which is the main purpose of the study.

Time Series techniques address the shortcomings of OLS regression (where stationarity is assumed or derived by taking the difference form of the variables, thus losing long run theoretical values) by taking the cointegration technique of Engle and Granger (1987) and this requires the variables to be non-stationary at the level form and stationary at the differenced form.

The Augmented Dickey-Fuller (ADF) test is undertaken on the variables in both their level and differenced forms. The null hypothesis is the non-stationarity.

We determine whether to accept the null hypothesis by testing whether the test statistic is greater (reject null) or less (accept null) than the 95% critical value where the test statistic of the ADF regression order is selected from the highest values of the AIC and SBC.

Full results are given in the appendix and are summarised below:

Variable	Test Statistic: AIC/SBC	Critical Value	Result
DBT	1.6631/2.5842	3.6027	Non-stationary
LLBR	2.1506/1.7243	3.6027	Non-stationary
LGDP	3.5098/2.3583	3.6027	Non-stationary
LSVG	1.11567/1.11567	3.6027	Non-stationary
DDBT	3.4130/3.7099	2.9907	Stationary
DLLBR	4.8507/4.8507	2.9907	Stationary
DLGDP	4.2431/4.2431	2.9907	Stationary
DLSVG	3.9837/3.9837	2.9907	Stationary

The inference from these results is that all the variables are unit root or I(1) and thus we may proceed with cointegration tests.

We also run the Phillips-Perron test and record the results in the appendix. The null hypothesis is that the variable is non-stationary and is determined by the T-ratio/p-value of the first differenced form of the variable

6.2. Step 2 Determining the order of the VAR

This test precedes the cointegration test to determine the vector auto regression (VAR) being the number of lags to be used. Full results are given in the appendix and the result is that under a maximum order of VAR of either 3 or 4 AIC and SBC recommend different Order of VAR of 2 and 0 respectively.

Given the small number of observations due to the limited dataset available, we will proceed with the AIC recommendation of 2 for the order of the VAR.

6.3. Step 3 Cointegration test

Cointegration tests whether the variables are theoretically related in the long-term, i.e. whether they are stationary together (although individually non-stationary). First we test using the Engle-Granger cointegration method, running an OLS regression with one of the variables as a dependent variable. The null hypothesis is non-stationary, determined by a unit root test of the residuals from the OLS regressions. Full results are provided in the appendix and we find that the Engle-Granger test does not find the presence of a single cointegration as the null hypothesis cannot be rejected given that all the test statistics are always less than the 95% critical value of 4.5643 in all four differing cases of dependent variable.

We also perform the Johansen Test and this test finds the presence of one cointegrating vector based on the maximal Eigenvalue of the Stochastic Matrix and based on the trace of the stochastic matrix. Based on maximum SBC result we also find the presence of one cointegrating vector, though 4 cointgrating vectors are reported through the maximum AIC result.

6.4. Step 4 Long Run Structural Modelling (LRSM)

In this final step in testing theory, we undertake long run structural modelling (LRSM) to estimate the theoretical relationship between the variables by exact and over identification of the coefficients of the variables and test the significance of the estimated coefficients derived. The first exact overidentifying coefficients we set the Debt (DBT) variable to be one and find the other relative coefficients and their significance and the results are reported in the appendix. We then re-consider the model variables and set the GDP variable to 1 and report the resulting coefficients in the table below, showing the standard error of each estimate and whether the variable is significant or not.

Variable	Estimated Coefficient	SE	Comment
GDP	1	None	Variable of interest
DBT	0.0042	0.0015	Significant
LLBR	8.5867	1.7584	Significant
LSVG	-0.5900	0.4439	Insignificant

We then check the insignificant variable, Savings (LSVG), and run overidentification with the variable set to 0 and find that we cannot reject the null hypothesis (as the p-value of the Chi-sq is 0.198) and thus we reject this overidentifying restriction. We then run a further over-identifying restriction with GDP=1 and the LSVG=0.5 and we find confidence (p-value of 0.035) and hence we proceed and retain the Savings variable in the following cointegration equation:

$$\underset{}{GDP} + \underset{(0.0015)}{0.0042DBT} + \underset{(1.7584)}{8.5867LLBR} - \underset{(0.4439)}{0.59LSVG}$$

We have now completed the theoretical testing of the relationship between variables and in the next four steps we undertake test the causal relationship between the variables to better inform policy action given our research hypothesis and the informed theoretical relationship.

6.5. Step 5 Vector Error Correction Model (VECM)

This first step in ascertaining causality is vector error correction modelling (VECM) to determine whether a variable is exogenous (leading, independent) or endogenous (following, dependent). This technique tests the lagged error term in the cointegrating equation derived in Step 4 above and also provides for the coefficient of the lagged error term which informs the number of periods for the variable to return to long-run equilibrium if that variable is shocked.

Variable	ECM (-1) t-ratio p-value	Implication	Coefficient
DBT	0.266	Exogenous	-27.7387
LLBR	0.372	Exogenous	-0.0284
LGDP	0.074	Endogenous	-0.0327
LSVG	0.232	Exogenous	0.2181

The results indicate that the GDP variable is the only following dependent variable (though at the 90% level, not 95% level) and the other variables are all exogenous. This is in line with our expectations and we will now investigate their relative exogeneity in Step 6 which follows.

6.6. Step 6 Variance Decomposition (VDC)

Variance Decomposition (VDC) ascertains the relative endogeneity and exogeneity of the variables by decomposing the forecast errors of each variable in to relative proportions from shocks to each of the variables in the model.

Given the use of annual data over a relatively short number of observations we undertake shocks over horizons over 1, 3, 5 and 10 years and the results are consistent in terms of ranking as indicated in the tables below.

HORIZON =1					Rank of Exogeneity
	DBT	LBR	LGDP	LSVG	1. SAVINGS
DBT	38.49%	8.90%	28.76%	23.85%	2. DEBT
LBR	4.77%	12.53%	76.10%	6.60%	3. LABOUR
LGDP	44.12%	33.44%	2.15%	20.29%	4. GDP
LSVG	20.48%	29.27%	8.39%	41.86%	

HORIZON =3					Rank of Exogeneity
	DBT	LBR	LGDP	LSVG	SAVINGS
DBT	37.82%	12.01%	28.46%	21.72%	DEBT
LBR	5.83%	16.33%	71.54%	6.31%	LABOUR
LGDP	42.75%	34.76%	1.53%	20.96%	GDP
LSVG	20.34%	29.30%	8.91%	41.45%	

HORIZON =5					Rank of Exogeneity
	DBT	LBR	LGDP	LSVG	SAVINGS
DBT	37.80%	13.13%	28.30%	20.77%	DEBT
LBR	6.91%	18.29%	68.15%	6.66%	LABOUR
LGDP	42.05%	35.10%	1.16%	21.70%	GDP
LSVG	20.31%	29.38%	8.80%	41.52%	

HORIZON =10					Rank of Exogeneity
	DBT	LBR	LGDP	LSVG	SAVINGS
DBT	28.01%	36.37%	12.28%	23.33%	DEBT
LBR	7.93%	20.03%	65.15%	6.89%	LABOUR
LGDP	41.57%	35.40%	0.86%	22.17%	GDP
LSVG	20.27%	29.42%	8.75%	41.57%	

These results reveal that savings levels are consistently the most exogenous variable, followed by Debt and Labour. Intuitively, we would consider Labour to have a greater leading effect, though its ranking would not imply in any way that its long term effect is less important, it is less exogenous at the given levels in the data set, i.e. implying that policy makers would be well advised to address Savings and Debt levels given that the analysis considers these variables to be more exogenous to GDP.

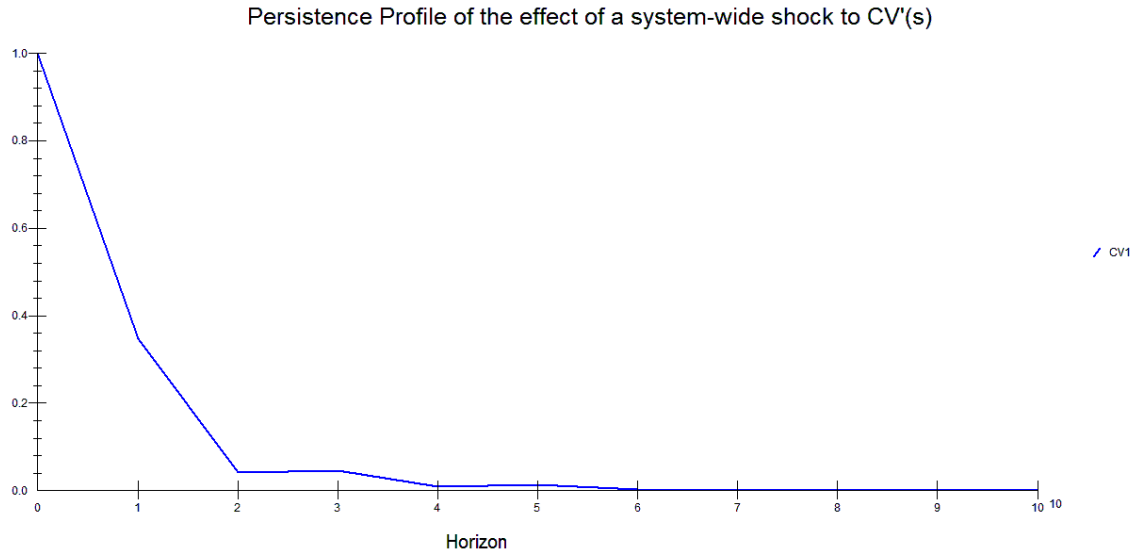
6.7. Step 7 Impulse Response Function (IRF)

The IRF are a graphical representation of the VDC results and are included in the Appendix. We have included graphs for both orthogonalised and generalised and the graphs illustrate quite long lead times (given the data is annualised) for the variables to return to equilibrium following a one-period standard deviation shock. In all cases the return to equilibrium takes in excess of five years.

6.8. Step 8 Persistence Profile

This final step in our causality tests considers a system-wide shock to the cointegrating equation of the variables and thus considers the long-run relationship linking the variables.

The graph below illustrates that the cointegrating relationship is quite robust as it only takes between 2 and 4 periods for the relationship to return to the equilibrium state following a system-wide shock.



This Persistence Profile is in line with the Malaysian experience in the period covering the dataset, where the economy experienced relatively high and dynamic growth in the 1990s which was fuelled by speculative capital and grand infrastructure development up until the 1997/98 Asian Financial Crisis and with policy controls, the impact of the crisis was dampened. Structural post-crisis remedies were put in place but these focused on improving financial infrastructure and resilience and not real-economy structural reforms and hence growth post the Asian Crisis has been limited but has remained steady since the latest 2008 Global Financial Crisis.

7. SUMMARY AND CONCLUSION

This study has been limited by the data available and also the limitations of the authors own analytical ability, nevertheless, the data is consistent with theoretical intuition and suggests that further investigation would be beneficial to understand the relationships and better inform policy makers so that coordinated policy action may be undertaken to address structural impediments to growth (perhaps relaxing restrictions in some areas) so that thresholds may be breached.

These types of innovative policy prescriptions may be required for Malaysia to break the middle-income trap and address structural issues. Advantage should be taken of the financial sector stability and solid base to move towards a more robust financial sector and introduce disruptive policy measures in areas such as education and labour so that growth is not achieved through consumption-led expenditure based on government-sector borrowing but is investment-led through the deployment of savings to improve the effect of labour, which is the main aim of growth (given labour is one part of capital, arguably the most important element, alongside the environment).

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